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WORKING PAPER
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Why are Wages in Portugal lower than elsewhere in EEC ?

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WP 3289-91-EFA

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Abstract

Wages are much lower in Portugal than in the European Community. In this paper we identify the basic determinants of the difference in nominal wages. The nominal wage gap is decomposed in three main components: exchange rate, productivity and industrial relations, which are further decomposed. Using comparable data, the contribution of each element to the nominal wage gap is quantified. The analysis is extended to bilateral comparisons between Portugal and Spain, Greece, and Ireland.

1 Introduction

It is well known that nominal wages are much lower in Portugal than in other countries of the European Community. Several are the reasons that can be offered to explain the wage gap between Portugal and its European partners.

Wages can be lower because the price level in Portugal is lower. Empirical research on international price level differences has long uncovered a positive relationship between countries' price levels and real wages.[1]

Another source of differentiation is a productivity gap between Portugal and other EEC members. This can be because of many different aspects. It can be due to poor technology choice by Portugal, affecting the total factor productivity. At a distinct level, differences in factor allocations due to factor endowments or market imperfections can result in a lower capital intensity for Portugal. But it can also be a consequence of

*We are grateful to Ana Paula Martins for comments and suggestions.

[1] See Irving Kravis and Robert Lipsey (1983) and Irving Kravis (1984).

arguments developed by human capital theory: perhaps the average education of the Portuguese worker and the skills acquired through on-the-job training are too low, thereby constraining the labor force to concentrate on less productive techniques;[2] this may be seen as a specific quality problem, which can be extended to other factors of production. On the other hand, if, at the aggregate level, more people is employed in activities with low productivity, e.g., agriculture and certain services, in Portugal than in other European countries, the distinct sectoral composition of activity also accounts for differences in productivity.

Other sources for the observed differences come from the organization and functioning of the labor markets. For example, Portuguese unions may lack bargaining power; then, even if the value of the marginal product of labor was the same in Portugal and abroad, Portuguese real wages could be lower if the degree of market competition was lower in Portugal and Portuguese employers were able to extract a larger rent from workers.[3] Another plausible explanation may be that jobs in Portugal are relatively safer than in other European countries, and greater job security has a tradeoff expressed in lower salaries.[4] A third source may be asymmetrical information: adverse selection and moral hazard in the labor market may well influence the wage level. Finally, the contributions to the social security can be responsible for discrepancies of the wages across countries, depending on the elasticity of the labor supply curve.

In this paper we try to highlight some basic determinants of the differences in nominal wages, relative to the block of the other eleven countries of EEC and perform bilateral comparisons with Spain, Greece and Ireland. Being these countries' wages below the European average, it is interesting to see how the different factors fare relative to Portugal, as well as to examine how the gap has changed over time in recent years. We follow an approach similar to the one used in Saint-Paul (1989), which first studied the subject. His work is extended, considering a higher level of disaggregation, and the role of the various assumptions is discussed in greater detail.

In the next section we present a simple methodology for decomposing the wage gap into various components. Section 3 presents the results of a preliminary disaggregation of the nominal wage gap into three factors: real exchange rate, productivity and industrial relations. This is done without requiring specific assumptions about the production technology. Then, in section 4, we decompose the productivity and the industrial relations gaps. The productivity gap is decomposed into a capital intensity gap and a total factor productivity gap; the latter is explained by the sectoral composition of the economies. Finally, in the industrial relations gap, differences in social security payments are taken into account. Section 5 concludes the paper and discusses possible extensions and methodological refinements.

[2] The wage and labor supply implications of education and training, i.e., human capital accumulation, have been extensively analyzed in Jacob Mincer (1962) and in Jacob Mincer (1974).

[3] For a survey of the literature on union-nonunion see Gregg Lewis (1984).

[4] Potential tradeoffs involving employment and wages are treated in, among others, John Pencavel (1984).

2 Methodology

Consider a simple model with two countries: Portugal and a foreign country. In each country the economy is described through similar aggregates and relations. Starred variables correspond to the foreign country, so that from the description of the structure of the Portuguese economy it must be clear the structure of the other country.

Let $F(K, L)$ be the Portuguese production function, where K represents the stock of capital and L the level of employment. The level of output is also represented by Y, so $Y \equiv F(K, L)$. Wages and prices are denoted by W and P, respectively. The real wage can be decomposed into two terms

$$\frac{W}{P} = \frac{\partial F(K,L)}{\partial L} + \left(\frac{W}{P} - \frac{\partial F(K,L)}{\partial L} \right) , \tag{1}$$

where the first term is the marginal productivity of labor and the second term a measure symmetrically related with the employer's rent. From basic microeconomic theory we know that if labor markets were competitive the employer's rent would be zero.

Define the employer's markup, μ, as

$$\mu = \frac{\frac{\partial F}{\partial L} - \frac{W}{P}}{\frac{\partial F}{\partial L}} \tag{2}$$

and expression (1) can be rewritten as

$$\frac{W}{P} = (1-\mu)\frac{\partial F(K,L)}{\partial L} . \tag{3}$$

Dividing (3) by its foreign analogue we get a first decomposition of the wage differential

$$\frac{W}{W^*} = \left(\frac{P}{P^*} \right) \left(\frac{\frac{\partial F(K,L)}{\partial L}}{\frac{\partial F^*(K^*,L^*)}{\partial L^*}} \right) \left(\frac{1-\mu}{1-\mu^*} \right) \tag{4}$$

The first factor is the real exchange rate gap, the second the productivity gap and the third the industrial relations gap.

The disaggregation in (4) requires an assumption about the functional form of the production function in both Portugal and the foreign country. As a first approximation, in order to isolate the terms that are independent of the functional form assumed for the production functions, we may get the analogue of expressions (1)–(4) using average values instead of marginal values. Accordingly, we would get the decomposition of the wage gap as

$$\frac{W}{W^*} = \left(\frac{P}{P^*} \right) \left(\frac{Y/L}{Y^*/L^*} \right) \left(\frac{1-\nu}{1-\nu^*} \right) , \tag{5}$$

where ν is the employer's average mark-up, i.e.,

$$\nu = \frac{\frac{Y}{L} - \frac{W}{P}}{\frac{Y}{L}} . \tag{6}$$

This decomposition is used to estimate the wage gap, in section 3.

The next step further decomposes the components in (4). The real exchange rate gap does not have a particularly interesting decomposition, and it is already a primitive element of the wage gap. More relevant seem to be the decompositions of the productivity and the industrial relations gaps.

To decompose the productivity gap we assume that both countries have a constant returns to scale Cobb-Douglas production function, with the same labor coefficient, α, i.e.,

$$F(K, L) = AK^{1-\alpha}L^{\alpha} \tag{7}$$

$$F^*(K^*, L^*) = A^*K^{*1-\alpha}L^{*\alpha} . \tag{8}$$

The choice of the constant returns to scale Cobb-Douglas production function to describe the Portuguese economy is consistent with recent findings in this area.[5] To allow an easier interpretation of the results we use an equivalent functional form for the production function of the foreign country. More problematic is the assumption of equal labor coefficients between countries. The main reason is that it allows us a straightforward isolation of the gap in total factor productivity. Moreover, from a purely theoretical perspective, it provides a simple solution to the problem of aggregating, at the European Community level, the individual countries' production functions. Similar arguments are used when we later study the effect of the sectoral composition of each economy and assume a particular technology for each sector in each country.[6]

Using (7)–(8) the productivity gap is then decomposed in several elements. First, we consider the effect of the capital intensity,[7] using the following relationship

$$\frac{\frac{\partial F(K/L, 1)}{\partial L}}{\frac{\partial F^*(K^*/L^*, 1)}{\partial L^*}} = \left(\frac{\frac{\partial F(K/L, 1)}{\partial L}}{\frac{\partial F(K^*/L^*, 1)}{\partial L}} \right) \left(\frac{\frac{\partial F(K^*/L^*, 1)}{\partial L}}{\frac{\partial F^*(K^*/L^*, 1)}{\partial L^*}} \right) . \tag{9}$$

The first term corresponds to the capital intensity gap, which results from differences in the capital intensity

[5] Work performed by Branco and Saint-Paul (1989) showed that, even though the point estimate of the returns to scale in the Portuguese economy was around 1.3, one could not reject the hypothesis of constant returns to scale. Moreover, estimating a CES production function the hypothesis of unit elasticity of substitution was not rejected. These results also justified similar assumptions in Saint-Paul (1989).

[6] If the labor coefficient varied across countries, we would need to estimate a production function for each country, and the aggregation would be non trivial. Moreover, the estimated coefficients would , probably, not change very much across countries.

[7] The constant returns to scale assumption implies that the marginal productivities depend only on the capital intensity coefficient, which then plays an important role in the productivity gap.

between countries, and the second term measures the total factor productivity, which corresponds to the gap that would exist even if Portugal had the same capital intensity as the foreign country. With the previous assumptions about the technologies, the disaggregation in (9) can be given by

$$\frac{\frac{\partial F(K/L,1)}{\partial L}}{\frac{\partial F^*(K^*/L^*,1)}{\partial L^*}} = \left(\frac{K/L}{K^*/L^*}\right)^{1-\alpha} \left(\frac{Y K^{\alpha-1} L^{-\alpha}}{Y^* K^{*\alpha-1} L^{*-\alpha}}\right) , \tag{10}$$

where we use the fact that

$$A = Y K^{\alpha-1} L^{-\alpha} .$$

The total factor productivity gap can be further decomposed,[8] by considering differences in the sectoral allocation of factors of production. We consider three sectors (agriculture, industry and services) in each economy. Again, we assume that each sector has a constant returns to scale Cobb-Douglas technology, with the same labor coefficient, i.e.,

$$F_i(K_i, L_i) = A_i K_i^{1-\alpha} L_i^{\alpha} , \quad i = A, I, S \tag{11}$$

where the subscript i denotes the sector. The aggregate production function is then easily obtained,

$$F(K, L) = \left(\sum_{i=A,I,S} A_i k_i^{1-\alpha} l_i^{\alpha} \right) K^{1-\alpha} L^{\alpha} , \tag{12}$$

which represents an alternative way of writing the production function in (7). In expression (12) k_i and l_i are the shares of total capital and labor allocated to sector i. The total factor productivity gap is thus dependent on the sectoral allocation of the resources. Following an approach similar to that in the initial decomposition of the productivity gap, we can isolate the gap due to the sectoral allocation of the production factors, the sectoral composition gap, from the gap due to overall differences in productivity, the residual gap,[9] and write

$$\frac{\frac{\partial F(K^*/L^*,1)}{\partial L}}{\frac{\partial F^*(K^*/L^*,1)}{\partial L^*}} = \left(\frac{\sum_i A_i k_i^{1-\alpha} l_i^{\alpha}}{\sum_i A_i k_i^{*1-\alpha} l_i^{*\alpha}}\right) \left(\frac{\sum_i A_i k_i^{*1-\alpha} l_i^{*\alpha}}{\sum_i A_i^* k_i^{*1-\alpha} l_i^{*\alpha}}\right) . \tag{13}$$

The first factor is the gap that would exist if the both countries has the same production function and capital intensity, but distinct sectoral structures; the second factor captures the gap due to differences between the production functions.

[8] Note that the total factor productivity gap is just the ratio of the coustants.

[9] The residual gap does not have a particular interpretation, mainly because it will aggregate all the errors introduced by the previous assumptions.

Making use of the assumptions about the technologies we get

$$\frac{\frac{\partial F(K^*/L^*,1)}{\partial L}}{\frac{\partial F^*(K^*/L^*,1)}{\partial L^*}} = \left(\frac{1}{\sum_i y_i \left(\frac{k_i^*}{k_i}\right)^{1-\alpha} \left(\frac{l_i^*}{l_i}\right)^{\alpha}} \right) \left(\frac{\frac{\sum_i Y_i \left(\frac{k_i^*}{k_i}\right)^{1-\alpha} \left(\frac{l_i^*}{l_i}\right)^{\alpha}}{K^{1-\alpha} L^{\alpha}}}{\frac{Y^*}{K^{*1-\alpha} L^{*\alpha}}} \right) \tag{14}$$

where y_i denotes sector i's share in output.

Next we decompose the industrial relations gap. At this stage we only isolate the effect of the contributions to the social security. Taking a very simple model of the labor market, it is clear that the effect of the contributions to the social security on the wages depends on the elasticity of the labor supply; if the labor supply is vertical, the level of wages is independent of the contributions because the workers effectively bear all the payment; on the other hand, if the labor supply is perfectly elastic, the level of wages varies one-to-one with the contributions to the social security because the employers effectively bear all the payment. Following the type of disaggregation presented in (4), the contributions to the social security only affect the industrial relations term, which can then be decomposed as

$$\frac{1-\mu}{1-\mu^*} = \left(\frac{\frac{W/P}{\frac{\partial F(K,L)/\partial L}{}(1-c)^{\gamma}}}{\frac{W^*/P^*}{\frac{\partial F^*(K^*,L^*)/\partial L^*}{}(1-c^*)^{\gamma}}} \right) \left(\frac{1-c^*}{1-c} \right)^{\gamma}, \tag{15}$$

where c is the proportion of the wage bill representing contributions to the social security. The parameter γ measures the effect of the contributions on the real wage; if the labor supply is inelastic, the contributions do not affect the wage and γ is equal to zero; if labor supply is perfectly elastic, variations in the contributions are totally reflected in the wage and γ equals one; hence γ has value in $[0, 1]$, depending on the elasticity of the labor supply curve. The first factor is the firms' rent gap and the second is the social security gap. With the assumptions about the technologies, we can compute each term in (15). The industrial relations gap is

$$\frac{1-\mu}{1-\mu^*} = \frac{\frac{WL}{PY}}{\frac{W^*L^*}{P^*Y^*}} \tag{16}$$

which uses the fact that, with a constant returns to scale Cobb-Douglas function, the marginal productivity of labor is proportional to the average productivity of labor, with proportionality constant equal to α, assumed to be equal across countries.

Year	Wage Gap	Exch. Rate	Prod.	Indust. Relat.	Contribution to Wage Gap: Exch Rate	Prod.	Indust. Realt.
1965	0.245	0.640	0.464	0.826	31.8%	54.6%	13.6%
1970	0.307	0.678	0.506	0.895	32.9%	57.7%	9.4%
1972	0.312	0.641	0.495	0.981	38.1%	60.3%	1.6%
1974	0.371	0.690	0.487	1.104	37.5%	72.5%	-10.0%
1976	0.411	0.605	0.520	1.309	56.6%	73.7%	-30.3%
1978	0.299	0.526	0.480	1.183	53.1%	60.8%	-13.9%
1980	0.280	0.498	0.497	1.132	54.8%	55.0%	-9.7%
1982	0.293	0.532	0.494	1.115	51.5%	57.4%	-8.9%
1984	0.247	0.500	0.450	1.097	49.6%	57.0%	-6.6%
1985	0.255	0.514	0.459	1.078	48.6%	56.9%	-5.5%
1986	0.253	0.499	0.482	1.054	50.7%	53.1%	-3.8%
1987	0.287	0.520	0.483	1.143	52.4%	58.4%	-10.7%
1988	0.297	0.534	0.480	1.161	51.8%	60.5%	-12.3%

Table 1: Wage Gap between Portugal and Europe

To decompose the industrial gap we then use

$$\frac{1-\mu}{1-\mu^*} = \left(\frac{\frac{WL}{PY}(1-c)^\gamma}{\frac{W^*L^*}{P^*Y^*}(1-c^*)^\gamma} \right) \left(\frac{1-c^*}{1-c} \right)^\gamma . \tag{17}$$

This disaggregation is correct if we assume that the sensitivity of the salaries to the social security contributions is virtually equal across countries.[10]

3 Wage Gap: Preliminary Disaggregation

In this section we provide a first disaggregation of the nominal wage gap. As a first approximation and to avoid assumptions about the production functions, we use the decomposition in expression (5), i.e., using averages,[11]

$$\frac{W}{W^*} = \left(\frac{P}{P^*} \right) \left(\frac{Y/L}{Y^*/L^*} \right) \left(\frac{1-\nu}{1-\nu^*} \right) .$$

With the data described in appendix, we computed the components of the wage gap between Portugal and the other countries, which are presented in Tables 1–4.

Table 1 shows the nominal wage gap between Europe and Portugal and its decomposition in the real

[10] The assumption is justified by the inexistence of any reason supporting different parameter γ choices.

[11] This is also the marginal decomposition if both countries have a Cobb-Douglas production function with the same labor coefficient.

exchange rate factor,[12] the productivity factor and the industrial relations factor; the contribution due to each factor is also presented in percentage. The column Wage Gap shows that Portuguese wages have been significantly lower than the European average, roughly 70% lower. The wage gap improved briefly in the seventies, especially in the years right after the revolution of 1974. It is also apparent that the gap has deteriorated since 1978 and in 1984 it was at the level of the sixties. The deterioration was dramatic in 1978 and again in 1984. More recently there has been a slight improvement, though the situation in the late eighties is still much different from that at the beginning of the decade. The table also shows that the wage gap has been declining since Portugal joined the EEC, at the beginning of 1986.

Across the table the contribution of each factor to the nominal wage gap is measured considering that the contribution of the other two factors was zero.[13] So, in 1986, lower prices in Portugal could account for Portuguese salaries roughly 50% of those in Europe. Similarly, for that same year, the relatively lower productivity could explain why salaries in Portugal were 48% of those in Europe. During the late sixties and early seventies the exchange rate was responsible for 35% lower wages in Portugal relative to Europe, representing around one third of the nominal wage gap; after 1974 the exchange rate increased its contribution to about 50%, mainly as a consequence of real depreciations during the periods from 1974 to 1978 and from 1982 to 1984. From the table it is apparent that the main contributor to the wage gap is the productivity. Note that this factor has kept its level around 50% during the sample period, suggesting the persistence of a structural disadvantage relatively to Europe. Given the stability of the productivity gap, the industrial relations gap has to explain part of the fluctuations. Since the revolution, the contribution to the nominal wage gap due to industrial relations has simply disappeared: if there was no gap due to the exchange rate and productivity, labor laws and union power would have taken Portuguese wages above the European average. This contrasts with the disadvantageous but improving situation during the years that preceded the revolution. The declining trend of the industrial relations factor was reversed after 1986. This could be the result of a purely EEC effect, in which the Portuguese labor force would demand higher salaries to compensate for higher prices and lower wage differences relative to their European counterparts. To the extent that joining the EEC would improve business conditions, employers would be prepared to accommodate such demands.[14]

Tables 2–4 show the decomposition as well as the nominal wage gap relative to three European partners in a state of economic development closer to that of Portugal. The results for the different countries are remarkably different. It is quite interesting to see that the gap relative to Spain has deteriorated systematically since 1976, until both countries joined the EEC, and in 1988 it was only 10% away from the European average. This can be attributed mainly to losses in relative purchasing power as well as in relative produc-

[12] The gap is obtained deducing 1 to the factor.

[13] All other numbers equal to one.

[14] An alternative explanation is the *ex-post* renegotiation of wages imposed by the unions, in 1987, after the government failed the inflation target, as well as by the lack of credibility, reflected in a premium demanded in future salaries.

Year	Wage Gap	Exch. Rate	Prod.	Indust. Relat.	Contribution to Wage Gap: Exch. Rate	Prod.	Indust Realt.
1965	0.438	0.970	0.607	0.743	3 7%	60.4%	35.9%
1970	0.531	1.013	0.642	0 817	-2.1%	70.1%	32.0%
1972	0.502	0.946	0.616	0.861	8 1%	70 2%	21.6%
1974	0.529	0.910	0.581	0.999	14.8%	85 1%	0 1%
1976	0.545	0 810	0.596	1.131	34 8%	85 4%	-20.3%
1978	0.414	0.728	0.536	1 062	36.0%	70 8%	-6 8%
1980	0.358	0.643	0.541	1 030	43 1%	59 8%	-2 9%
1982	0.373	0.688	0.528	1.026	37.9%	64 8%	-2 6%
1984	0.328	0 680	0.469	1 030	34 7%	67 9%	-2.6%
1985	0.335	0.690	0.472	1 029	33.9%	68 7%	-2.6%
1986	0.345	0 680	0.486	1 042	36 2%	67 6%	-3.8%
1987	0 398	0.695	0.503	1 140	39 6%	74 6%	-14 2%
1988	0.395	0.680	0 502	1 157	41 6%	74 2%	-15 7%

Table 2: Wage Gap between Portugal and Spain

tivity, but while the former appeared with explanatory power after the revolution, the latter has always been important. The industrial relations gap has, however, contributed positively to diminish the nominal wage gap between Spain and Portugal since the mid-seventies.

Relative to Greece the nominal wage gap did not change much, until Portugal joined the EEC, although it has evolved in a volatile manner throughout the period. Note that Portuguese salaries have been around one-half of those in Greece, though in recent years the difference has had a big reduction. In recent years, the contribution to the gap due to both the productivity and exchange rate has decreased. However, labor laws and union power in Greece seem to push the wage bill in Greece above the Portuguese one, which is in part compensated by small gains in the average productivity of labor in Portugal. There are two factors which differ in the comparison with Greece to that with other countries: the productivity gap is smaller and the industrial relations gap, which plays an important role, is disadvantageous to Portugal. Also the gains from joining the EEC are much more evident in the comparison with Greece.

Ireland has seen the nominal wage gap eroding rapidly until 1976, when the Portuguese wages were 38% lower. Since then the nominal wage gap started to widen and Portuguese wages finished 72% lower in 1986, very close to the European average. After that, the EEC effect has contributed to reduce the gap, mainly due to the exchange rate and the industrial relations factors, while no evidence in productivity gains is observed. As in the case of Greece, the contribution of the productivity factor has steadily lost importance to the exchange rate. Next we attempt to further decompose the productivity gap and the industrial relations gap, following the steps outlined in section 2.

Year	Wage Gap	Exch. Rate	Prod	Indust. Relat.	Contribution to Wage Gap: Exch. Rate	Prod.	Indust. Realt.
1970	0.489	0.701	0.884	0 789	49 6%	17.2%	33.2%
1972	0.561	0.768	0.816	0 895	45.7%	35 1%	19.3%
1974	0.673	0.737	0.832	1 097	76 9%	46 5%	-23.3%
1976	0.757	0.729	0.818	1.270	113 6%	72.1%	-85.7%
1978	0.506	0.664	0.743	1.025	60 1%	43 6%	-3.7%
1980	0.537	0.697	0.771	0.998	58 0%	41 8%	0 3%
1982	0.485	0.648	0.819	0.914	60.0%	27.6%	12 5%
1984	0 421	0.636	0 770	0 860	52.3%	30.3%	17.4%
1985	0.449	0 698	0.785	0.819	44 8%	30.3%	24.9%
1986	0.521	0.782	0.809	0.824	37 8%	32 5%	29.7%
1987	0 667	0.822	0.861	0.942	48 2%	37 0%	14 8%
1988	0 659	0 825	0.851	0.939	46 2%	38 7%	15.1%

Table 3: Wage Gap between Portugal and Greece

Year	Wage Gap	Exch Rate	Prod.	Indust Relat.	Contribution to Wage Gap: Exch Rate	Prod	Indust. Realt.
1965	0 335	0.658	0.696	0.732	38 2%	33 2%	28.6%
1970	0.417	0.701	0 757	0.786	40 6%	31 9%	27 5%
1972	0.417	0 636	0.725	0.903	51 6%	36.7%	11 7%
1974	0.525	0 771	0.705	0.966	40.4%	54 3%	5 3%
1976	0.616	0.760	0.685	1.182	56.6%	78.0%	-34.5%
1978	0 435	0.626	0.641	1.084	56 2%	53 4%	-9 6%
1980	0 365	0.566	0.674	0.958	56 5%	39 2%	4 3%
1982	0 350	0.539	0.649	1.001	58 9%	41.3%	-0.1%
1984	0 280	0.497	0.578	0.975	54.9%	43 1%	2.0%
1985	0.282	0.504	0.580	0 965	54.1%	43 1%	2.8%
1986	0 284	0 500	0.607	0 937	55 1%	39 7%	5.2%
1987	0.328	0.529	0.594	1.047	57.2%	46.9%	-4.1%
1988	0 346	0 543	0.584	1.091	57.5%	50 8%	-8 2%

Table 4: Wage Gap between Portugal and Ireland

Year	Prod	Cap. Int.	Fact Prod	Sect. Comp.	Resid.	Contribution to Wage Gap: Cap. Int.	Fact Prod	Sect Comp.	Resid.
1965	0.464	0.748	0.620	0.816	0.760	20.7%	34.0%	14.5%	19.5%
1970	0.506	0.768	0.658	0.996	0.660	22.3%	35.4%	0.3%	35.1%
1972	0.495	0.765	0.647	0.967	0.670	23.0%	37.3%	2.9%	34.4%
1974	0.487	0.750	0.650	0.920	0.706	29.1%	43.5%	8.4%	35.1%
1976	0.520	0.743	0.699	0.944	0.741	33.4%	40.3%	6.5%	33.8%
1978	0.480	0.750	0.640	0.782	0.818	23.9%	37.0%	20.4%	16.6%
1980	0.497	0.745	0.667	0.800	0.835	23.1%	31.8%	17.7%	14.2%
1982	0.494	0.746	0.663	0.842	0.788	23.9%	33.5%	14.1%	19.5%
1984	0.450	0.745	0.604	0.881	0.686	21.1%	36.0%	9.1%	26.9%
1985	0.459	0.746	0.616	0.875	0.704	21.4%	35.5%	9.8%	25.7%
1986	0.482	0.745	0.647	0.885	0.731	21.5%	31.7%	8.9%	22.8%
1987	0.483	0.745	0.648	0.881	0.736	23.6%	34.8%	10.2%	24.6%
1988	0.480	0.744	0.645	0.886	0.728	24.3%	36.2%	10.0%	26.2%

Table 5: Productivity Gap between Portugal and Europe

4 Wage Gap: Detailed Decomposition

4.1 Decomposing the Productivity Gap

Here we try a disaggregation of the productivity gap. In order to decompose the gap in productivity and explain its causes it is necessary to specify the production technology in both countries. It is assumed that Portugal and other European countries have constant returns to scale Cobb-Douglas production functions. As stated in section 2, it is assumed that the labor coefficient α is the same in Portugal and abroad; more specifically, for the basic calculations, we use a value of α set at 0.6.[15]

Because of the assumption of constant returns to scale, we consider two components. One reflects differences of factor endowments and uses, i.e., the effect of differences in capital and labor if the production function in Portugal and abroad was the same. This first factor is called the capital intensity factor. The other factor assumes no gap in capital intensity and reflects differences in the production function between Portugal and Europe, and is called total factor productivity. The disaggregation and computations are performed using the decomposition given in (10), i.e.,

$$\frac{\frac{\partial F(K/L,1)}{\partial L}}{\frac{\partial F^*(K^*/L^*,1)}{\partial L^*}} = \left(\frac{K/L}{K^*/L^*}\right)^{1-\alpha} \left(\frac{Y K^{\alpha-1} L^{-\alpha}}{Y^* K^{*\alpha-1} L^{*-\alpha}}\right) .$$

The results of this decomposition are presented in Tables 5–8.

[15] Saint-Paul (1989) reports an estimate of α around 0.55 for France, while Branco and Saint-Paul (1989) have estimated an α around 0.6 for Portugal.

Table 5 shows that the capital intensity in Portugal relative to the European average has deteriorated since the early seventies. If the other factors had a neutral effect on the gap, namely the ratio of price levels and the industrial relations, portuguese wages should be lower (around 75%) than the European wages due to lower capital intensity in Portugal. This could be the result of many factors, such as permanent overmanning combined with low levels of net capital formation in Portugal, or even the relative underdevelopment of the Portuguese financial markets. If instead of the absolute levels we look at the percent contributions to the nominal wage gap, it is clear that the large deterioration of the capital intensity in the mid-seventies turned into an improvement in the eighties.

Although isolating the capital intensity factor helps to explain the productivity gap between Europe and Portugal, it is apparent from the tables that the contribution of the total factor productivity for the wage gap is in general more important. Because of this importance, our next exercise attempts to explain the gap in total factor productivity. This gap captures the difference in the value of the constants of the production functions between Portugal and the foreign country. It can be due to several factors, e.g., education, though at this stage we only measure the effect of the sectoral composition of the economies. Following the methodology described in section 2 we consider three sectors (agriculture, industry and services) and decompose the total factor productivity gap according to expression (14)

$$\frac{\frac{\partial F(K^*/L^*,1)}{\partial L}}{\frac{\partial F^*(K^*/L^*,1)}{\partial L^*}} = \left(\frac{1}{\sum_i y_i \left(\frac{k_i^*}{k_i}\right)^{1-\alpha} \left(\frac{l_i^*}{l_i}\right)^{\alpha}} \right) \left(\frac{\frac{\sum_i Y_i \left(\frac{k_i^*}{k_i}\right)^{1-\alpha} \left(\frac{l_i^*}{l_i}\right)^{\alpha}}{K^{1-\alpha} L^{\alpha}}}{\frac{Y^*}{K^{*1-\alpha} L^{*\alpha}}} \right)$$

Table 5 also presents the disaggregation of the total factor productivity in the case of the Europe. The series has two sub-periods: from 1965 to 1976 and after this year to the end of the sample. Different sectoral composition seem to have been more important in explaining the productivity gap, and therefore the wage differential, in the last period. During the late sixties and early seventies the gap has closed dramatically relative to the European average, perhaps because this period corresponds to significant migration to other countries and urban zones by labor traditionally employed in the Portuguese agriculture. If Portugal had levels of capital intensity equivalent to the European average, there was no purchasing power parity deviations, and assuming no differences in the industrial relations gap, wages in Portugal would have been 30% to 35% lower than in Europe, for the period 1965 to 1976. From Table 1 one can see that during this period the industrial relations factor has increased monotonically in a significant manner. It is possible, therefore, that the mere reallocation of labor might have contributed to greater union power since organized labor is

Year	Prod	Cap. Int	Fact. Prod	Sect. Comp.	Resid.	Contribution to Wage Gap: Cap. Int.	Fact. Prod	Sect Comp.	Resid.
1965	0.607	0 822	0 739	0.908	0.814	23.8%	36.6%	11 7%	24.9%
1970	0.642	0.839	0.765	1.089	0.703	27 8%	42.3%	-13.5%	55.8%
1972	0.616	0 843	0 730	1.067	0.685	24.7%	45 6%	-9 4%	55.0%
1974	0.581	0.821	0.709	1.003	0.706	31.0%	54.0%	-0.5%	54.5%
1976	0.596	0.793	0.751	1.027	0.731	38.2%	47 3%	-4 4%	51 7%
1978	0.536	0.776	0.691	0.863	0.800	28.8%	42.0%	16.7%	25.2%
1980	0.541	0.749	0.723	0.874	0.827	28 2%	31.7%	13.2%	18.5%
1982	0.528	0.743	0.711	0.916	0.776	30.1%	34 7%	8 9%	25.8%
1984	0.469	0 733	0.640	0.954	0.671	27 9%	40.1%	4 2%	35.9%
1985	0.472	0.731	0 645	0.950	0.680	28.7%	40.0%	4 7%	35.3%
1986	0.486	0 735	0 662	0 947	0.699	28.9%	38.7%	5 1%	33 7%
1987	0.503	0 745	0 676	0.937	0.722	32.1%	42.6%	7 1%	35.42%
1988	0.502	0.747	0.673	0.941	0.715	31 5%	42 7%	6 5%	36.2%

Table 6: Productivity Gap between Portugal and Spain

more evident in manufacturing and services than in agricultural related activities. To conclude that the declining trend in the industrial relations factor after 1977–78 is related to a larger sectoral composition gap is, however, incorrect. In our view the industrial relations factor has decreased due to corrective actions imposed by the market discipline. The widening of the sectoral composition gap, on the other hand, can be explained by the implementation of supply side policies in many European countries, delayed in Portugal by the successive governments. Extensive reorganization and massive layouts contributed to gains in labor productivity in the European industry relative to Portugal. And while in Europe gains were made in the industrial sector, in Portugal, since the late seventies, employment continued to decline in agriculture mainly at the expense of the services sector. This sectoral migration may not have produced significant changes in labor productivity at the aggregate level, given that agriculture and some services are in general sectors where productivity is low.

The residual factor is very important in the first half of the seventies and in the last years of the sample, explaining 25% to 30% of the nominal wage gap. This reveals the importance of further analysis that helps to understand other important factors that have been ignored here.

Looking briefly at the individual countries in Tables 6–8, Spain has made global productivity gains as well as Ireland, especially after this country joined the EEC. The situation relative to Greece has first worsen to recover slightly during the eighties. In all cases it is apparent that the capital used per unit of the labor factor is much lower in Portugal than in any other European country. The capital intensity gap has, however, a recovery trend in the eighties relative to Spain and Greece, but it has declined relative to Ireland. With respect to Ireland this is important because it explains a significant share of the nominal wage gap.

As expected, the contribution of the sectoral composition to the gap is lower for the three countries than

Year	Prod	Cap. Int.	Fact. Prod.	Sect. Comp.	Resid.	Contribution to Wage Gap			
						Cap. Int.	Fact. Prod.	Sect. Comp.	Resid.
1970	0.884	1.097	0.806	1.193	0.675	-13.0%	30.2%	-24.7%	54.9%
1972	0.816	1.015	0.804	1.189	0.676	-2.6%	37.7%	-29.9%	67.6%
1974	0.832	0.946	0.879	1.118	0.787	14.1%	32.4%	-28.1%	60.5%
1976	0.818	0.934	0.876	1.138	0.770	24.5%	45.3%	-46.3%	93.9%
1978	0.743	0.927	0.802	0.948	0.846	11.2%	32.4%	7.9%	24.5%
1980	0.771	0.905	0.852	0.962	0.886	16.0%	25.8%	6.3%	19.5%
1982	0.819	0.916	0.895	1.004	0.891	12.2%	15.4%	-0.6%	15.9%
1984	0.770	0.913	0.843	1.048	0.804	10.5%	19.8%	-5.4%	25.2%
1985	0.785	0.914	0.859	1.042	0.824	11.3%	19.0%	-5.2%	24.2%
1986	0.809	0.908	0.891	1.054	0.845	14.8%	17.7%	-8.1%	25.8%
1987	0.861	0.907	0.949	1.025	0.926	24.0%	12.9%	-6.1%	19.0%
1988	0.851	0.907	0.938	1.036	0.906	23.4%	15.3%	-8.5%	23.8%

Table 7: Productivity Gap between Portugal and Greece

for the European average. Note, also, that in the case of Greece, sectoral composition alone would justify higher wages in Portugal, situation that seemed to persist for the case of Spain in the seventies, though later reversed. More recent data would allow a more careful characterization of the sectoral composition gap, with particular attention to the effects of the funds provided under the EEC entry treaty.

The unexplained part of the productivity gap is very important in the cases of Spain and Greece. For Ireland, however, it is neither as high nor as volatile as with the other two countries.

4.2 Decomposing the Industrial Relations Gap

The industrial relations gap combines the effect of many factors, e.g., bargaining power or the trade-off between job security and salaries. At this stage, we only isolate differences in social security payments. As noted before, the effect of social contributions depends on the conditions describing the equilibrium in the labor markets and, in particular, on the elasticity of the labor supply curves in Portugal and abroad. On the one hand, if the supply of labor is perfectly elastic, differences in social security contributions are fully reflected on the nominal wage gap. If, on the other hand, the supply for labor is vertical, social security contributions have no effect on the nominal wage gap. Under the first case the industrial relations gap does not depend on the social security contributions; hence, in the analysis so far, we consider the last case, decomposing the industrial relations gap assuming the case of a flat labor supply curve. The reader should keep in mind that the analysis that follows is purely sensitive. We are not claiming that the supply curve is flat or of any other particular form, since in our work there is no evidence supporting that or any other claim. Simply, we want to measure the effects on the wage gap by means of a very crude supply side adjustment, keeping constant the contribution of the industrial relations factor. This will allow us to

Year	Prod	Cap Int.	Fact Prod	Sect. Comp.	Resid.	Contribution to Wage Gap: Cap Int.	Fact. Prod.	Sect. Comp.	Resid.
1965	0.696	0.839	0.829	0.909	0.912	16.1%	17.1%	8.7%	8.5%
1970	0.757	0.917	0.825	1.088	0.758	9.9%	22.0%	-9.6%	31.6%
1972	0.725	0.889	0.816	1.070	0.762	13.4%	23.3%	-7.7%	31.0%
1974	0.705	0.858	0.822	1.017	0.808	23.7%	30.5%	-2.6%	33.1%
1976	0.685	0.845	0.811	1.029	0.788	34.7%	43.2%	-5.9%	49.1%
1978	0.641	0.851	0.753	0.846	0.890	19.3%	34.1%	20.1%	14.0%
1980	0.674	0.836	0.805	0.856	0.941	17.8%	21.5%	15.5%	6.0%
1982	0.649	0.823	0.788	0.897	0.879	18.6%	22.7%	10.4%	12.3%
1984	0.578	0.797	0.726	0.938	0.773	17.8%	25.2%	5.0%	20.2%
1985	0.580	0.784	0.740	0.931	0.795	19.2%	23.8%	5.7%	18.2%
1986	0.607	0.776	0.782	0.941	0.831	20.2%	19.6%	4.9%	14.7%
1987	0.594	0.761	0.780	0.934	0.834	24.6%	22.3%	6.0%	16.3%
1988	0.584	0.750	0.778	0.946	0.822	27.1%	23.6%	5.2%	18.4%

Table 8: Productivity Gap between Portugal and Ireland

separate union power that is directly reflected on wages from differences in social benefits between Portugal and other European countries.[16]

The disaggregation uses expression (17), taking γ equal to one,

$$\frac{1-\mu}{1-\mu^*} = \left(\frac{\frac{WL}{PY}(1-c)^\gamma}{\frac{W^*L^*}{P^*Y^*}(1-c^*)^\gamma} \right) \left(\frac{1-c^*}{1-c} \right)^\gamma .$$

and the results are presented in Tables 9–12.[17]

In Table 9 the industrial relations gap is decomposed for the average of the other eleven EEC countries. One immediately notices that after having net out social contributions, employers' rents were lower than for the case of $\gamma = 0$. This is because of higher social security contributions in Europe than in Portugal, also reflected in numbers less than 1 under the column Social Security.

Interestingly, while for Spain and Greece the social security contributions may justify lower wages in Portugal, the reverse is true for Ireland. Moreover, the level of the social security gap does not seem to close relative to either country. The effect relative to the case of Greece appears to be too high, which may reflect that our set of assumptions is particularly inappropriate in comparing Portugal with this country.

[16] A more rigorous analysis of the supply effects would take into account the possibility that the labor supply curves in Portugal and abroad imply differences on the effect of social security contribution on the nominal wage.

[17] Due to lack of data we had to stop this analysis in 1986.

Year	Indust. Relat.	Firm Rent	Soc. Sec.	Cont. to Wage Gap: Firm Firm	Cont. to Wage Gap: Soc. Soc.
1965	0.826	0.859	0.961	10.8%	2.8%
1970	0.895	0.920	0.972	7.0%	2.4%
1972	0.981	1.008	0.973	-0.7%	2.3%
1974	1.104	1.144	0.965	-13.6%	3.6%
1976	1.309	1.358	0.964	-34.4%	4.1%
1978	1.183	1.226	0.966	-16.8%	2.9%
1980	1.132	1.168	0.969	-12.2%	2.5%
1982	1.115	1.165	0.957	-12.5%	3.6%
1984	1.097	1.162	0.944	-10.7%	4.1%
1985	1.078	1.142	0.944	-9.7%	4.2%
1986	1.054	1.093	0.965	-6.5%	2.6%

Table 9: Industrial Relations Gap between Portugal and Europe

Year	Indust. Relat.	Firm Rent	Soc. Sec.	Contr. to Wage Gap: Firm Firm	Contr. to Wage Gap: Soc. Soc.
1965	0.743	0.736	1.010	37.1%	-1.2%
1970	0.817	0.823	0.992	30.7%	1.2%
1972	0.861	0.873	0.987	19.7%	2.0%
1974	0.999	1.028	0.973	-4.3%	4.4%
1976	1.131	1.148	0.985	-22.7%	2.4%
1978	1.062	1.136	0.935	-14.4%	7.6%
1980	1.030	1.114	0.925	-10.5%	7.6%
1982	1.026	1.119	0.917	-11.4%	8.8%
1984	1.030	1.142	0.902	-11.9%	9.3%
1985	1.029	1.141	0.902	-12.1%	9.5%
1986	1.042	1.131	0.921	-11.6%	7.7%

Table 10: Industrial Relations Gap between Portugal and Spain

Year	Indust Relat.	Firm Rent	Soc. Sec.	Contr. to Wage Gap: Firm Firm	Contr. to Wage Gap: Soc. Soc.
1970	0.789	0.876	0.901	18.6%	14.6%
1972	0.895	0.979	0.914	3.7%	15.5%
1974	1.097	1.193	0.919	-44.5%	21.2%
1976	1.270	1.392	0.912	-118.6%	32.9%
1978	1.025	1.115	0.920	-16.0%	12.3%
1980	0.998	1.120	0.891	-18.2%	18.5%
1982	0.914	1.065	0.858	-8.7%	21.1%
1984	0.860	1.015	0.847	-1.8%	19.2%
1985	0.819	0.964	0.850	4.6%	20.3%
1986	0.824	0.951	0.867	7.7%	22.0%

Table 11: Industrial Relations Gap between Portugal and Greece

Year	Indust Relat.	Firm Rent	Soc. Sec.	Contr. to Wage Gap Firm Firm	Soc Soc.
1965	0.732	0.683	1.072	34.9%	-6 3%
1970	0.786	0.725	1.084	36.7%	-9 2%
1972	0.903	0.822	1.098	22 3%	-10.7%
1974	0.966	0 895	1.079	17.2%	-11.8%
1976	1.182	1.099	1.076	-19.5%	-15 0%
1978	1.084	0.995	1.090	0.7%	-10 3%
1980	0.958	0.870	1.101	13 8%	-9.5%
1982	1.001	0.922	1 086	7 7%	-7 9%
1984	0.975	0.899	1.084	8 3%	-6 3%
1985	0.965	0.887	1.088	9 5%	-6.6%
1986	0.937	0.841	1 115	13 8%	-8 8%

Table 12: Industrial Relations Gap between Portugal and Ireland

5 Conclusions

This paper is an investigation of the reasons explaining why Portuguese wages are lower relative to those in other countries of the European Community. Using a simple model the wage gap is first decomposed into an exchange rate component, a productivity component and an industrial relations component. The productivity gap is further decomposed into a capital intensity gap and a sectoral composition gap. In the case of the industrial relations gap sensitivity analysis is performed to evaluate the effect of differences in social security contributions in Portugal and Europe.

Portuguese wages are significantly lower than the European average, roughly 70% lower. After having improved in the late sixties and early seventies, followed by a dramatic improvement in the years after the 1974 revolution, wages in Portugal have been in a declining trend, with abrupt drops in 1978 and in 1984. Recent observations, however, seem to show that the gap is closing after Portugal has joined the EEC, in 1986. This effect is obvious from the exchange rate factor, displaying an approximation of price levels between Portugal and Europe. Similar reason could explain the further increase in the industrial relations factor in favor of Portugal. In any case, Portuguese salaries are still significantly lower than those in Spain, Greece and Ireland, three countries in a state of economic development below the European average. Portuguese wages are 60% to 65% lower than Spanish ones and 35% lower than in Greece.

Of the various components explaining the gap, productivity appears to be the most important, although the exchange rate has been playing a greater role since the mid-seventies. In the last twenty years there has not been gains in productivity that could help to close the gap relative to Europe, while having a continuous deterioration relative to Spain. The capital intensity explains an important part of the productivity gap. This is especially true in the case of Spain. As expected, the sectoral composition of activity is more significant in explaining the wage gap in the case of Europe than for each of the three countries considered. The industrial

relations gap has a clear turning point in 1974. Since the revolution the contribution to the wage gap due to industrial relations has disappeared, except in relation to the Greece. That is, if there was no gap due to the other factors, labor laws and union power would have taken Portuguese wages above the European average.

Provided that the relevant data could be found, many other factors could be analyzed to extend and improve our investigation of the wage gap. Perhaps, a modified production function, adjusted for differences in education of the labor force, could uncover an education factor in the productivity gap. A different extension looks at the interaction between financing constraints and business investment in trying to account for differences in the functioning of the financial markets.

Appendix: The Data

To develop the work outlined in the preceding section, we obtained the appropriate database. In order to avoid incompatibilities among the series used, we tried, whenever possible, to use data from the same sources, in particular obtaining the same aggregates, for the different countries, from the same statistics.

The main statistical sources were the EUROSTAT data from the EEC.[18] There we got series for

- Nominal Output (at current prices in ECUs) — PY
- Real Output (at 1980 prices and Purchasing Power Standards) — Y
- Wage Bill (as percentage of the of the output) — wb
- Wage Employment — WE
- Total Employment — L
- Sectoral Employment — L_i
- Sectoral Output (at current prices in ECUs) — Y_i
- Social Security Contributions (as percentage of output) — ss
- Gross Fixed Capital Formation (at current prices in ECUs) — PI
- Real Gross Fixed Capital Formation (at 1980 prices and Purchasing Power Standards) — I
- Capital Consumption (at current prices in ECUs) — PD

[18] Some of the data for 1987-88 was directly received from the EEC Statistics Office. We thank José António Girão for supplying us with these data.

Then we computed the series we needed to implement the methodology of Section 2.

The wage index was computed as

$$W = \frac{wbY}{100WE} ;$$

the price index was computed as

$$P = \frac{PY}{Y} ;$$

the effective share of labor in the output as

$$\frac{WL}{PY} = \frac{wbL}{100WE} ;$$

the social security contributions relative to the wages as

$$SSC = ss\frac{PY}{WL} ;$$

the sectoral structure of employment as

$$l_i = \frac{L_i}{L} ;$$

the sectoral structure of output as

$$y_i = \frac{Y_i}{Y} .$$

The series for the Capital Stock were not available, so we constructed them from the available data on Investment (I_t) and Depreciations (D_t).[19] Let K_t be the correspondent (unknown) series of capital, which satisfies

$$K_{t+1} = K_t + I_t - D_t .$$

We assume that capital is depreciated according to the method of perpetual inventory, with depreciation rate δ, but there are shocks in the depreciation rate, ϵ_t, so that

$$\frac{D_t}{K_t} = \delta + \epsilon_t .$$

The shocks are assumed to exhibit first order serial correlation

$$\epsilon_{t+1} = \rho\epsilon_t + v_{t+1} ,$$

where v_t are independent and identically distributed with zero expectation.

[19]The data on Investment and Depreciations were taken from the EUROSTAT, except for Portugal which were taken from Santos (1984).

We use a least squares approach to estimate the series of capital and the depreciation rate. Consider the problem

$$\min_{\{e_t\}} \quad \sum_{t=2}^{T} (e_t - \rho e_{t-1})^2$$

$$\text{s.t.} \begin{cases} K_{t+1} = K_t + I_t - D_t & \\ & 1 \leq t \leq T \\ D_t = (\delta + e_t) K_t & \end{cases}$$

This problem can be solved by nonlinear least squares, with the usual techniques. We estimate the depreciation rate, $\hat{\delta}$, the first value of the capital stock, $\hat{K}_1$, and the correlation coefficient, ρ.[20]

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[20]The estimation was performed for the period 1972–1988, in which we had consecutive observations. The capital stock for 1965 and 1970 was estimated as $\hat{K}_t = D_t/\hat{\delta}$. To avoid a gap between the 1970 and 1972 values of the capital stock, the estimation restricted $e_1 = 0$. For a more detailed description of the procedure see Branco (1991).

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